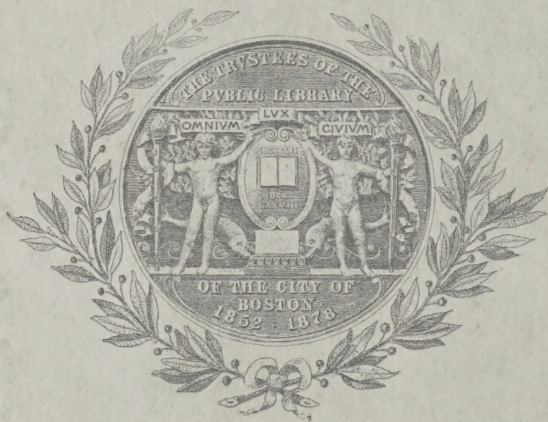



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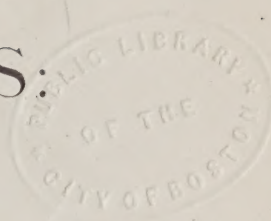


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FERN ETCHINGS:



ILLUSTRATING ALL THE SPECIES OF FERNS INDIGENOUS TO THE NORTHEASTERN UNITED STATES AND CANADA.

SECOND EDITION.

By JOHN WILLIAMSON,

Author of "Ferns of Kentucky."

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FERN ELLIS

ILLUSTRATING ALL THE TYPES OF BEES IN THE
NORTH TO THE VERMONTARY BEEHIVE
STATES AND CANADA

SECOND EDITION

BY JOHN W. WILLIAMS

PUBLIC LIBRARY
OF THE
CITY OF BOSTON

TO

GEORGE E. DAVENPORT,

OF BOSTON, MASS.

WHOSE FACE I HAVE NOT SEEN, BUT WHOSE EARNEST DEVOTION TO
THIS BRANCH OF SCIENCE AND KINDLY INTEREST IN MY WORK HAVE
PUT ME DEEPLY IN HIS DEBT,

I DEDICATE THIS VOLUME.

J. W.

PREFACE TO THE SECOND EDITION.

The kind reception given by the public to the first edition of this work has induced the author, after the lapse of a few months, to issue the present one. Two new plates have been added so as to include all the species indigenous to the Northern United States and Canada. One, the *Adiantum Capillus-Veneris*, was recently found in the mountains of Virginia; the other, *Cystopteris montana*, is a well-known Canadian species. A new and unexpected locality for *Scolopendrium vulgare* has been discovered at South Pittsburg, Tennessee, by Mr. JOHN A. CHEATHAM.

The plates in this volume are arranged according to Davenport's Catalogue of North American Ferns. The same nomenclature is also adopted, with the single exception of the name on Plate xxxviii, where that given in Gray's Manual is retained.

The descriptions are taken from the works of Profs. GRAY and EATON, for the use of which I wish to express my most sincere thanks.

I am also indebted to the following botanists for extensive suits of specimens from which the drawings in many cases have been made: DAVID A. P. WATT, Montreal, Canada; JOHN H. REDFIELD, Philadelphia; GEORGE E. DAVENPORT, Boston; and Prof. R. H. WILDBERGER, Farmdale, Kentucky.

Since the "Ferns of Kentucky" was published three species of ferns have been added to the flora of the state, *Cheilanthes Alabamensis*, *Asplenium parvulum*, and *Asplenium ebenoides*.

J. W.

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PLATE I.

POLYPODIUM VULGARE. LINNÆUS.

COMMON POLYPODY.

Fronde evergreen, oblong, smooth both sides, 4 to 10 inches high, simply and deeply pinnatifid; the divisions linear-oblong, obtuse, minutely and obscurely toothed. Rocks; common. July.—*Gray's Manual.*

This fern in some localities is so common that it gives a character to the vegetation. The creeping root-stock imbedded in the moss, spreading out in every direction, often covers great masses of rock. I have found it in the sandstone region only.

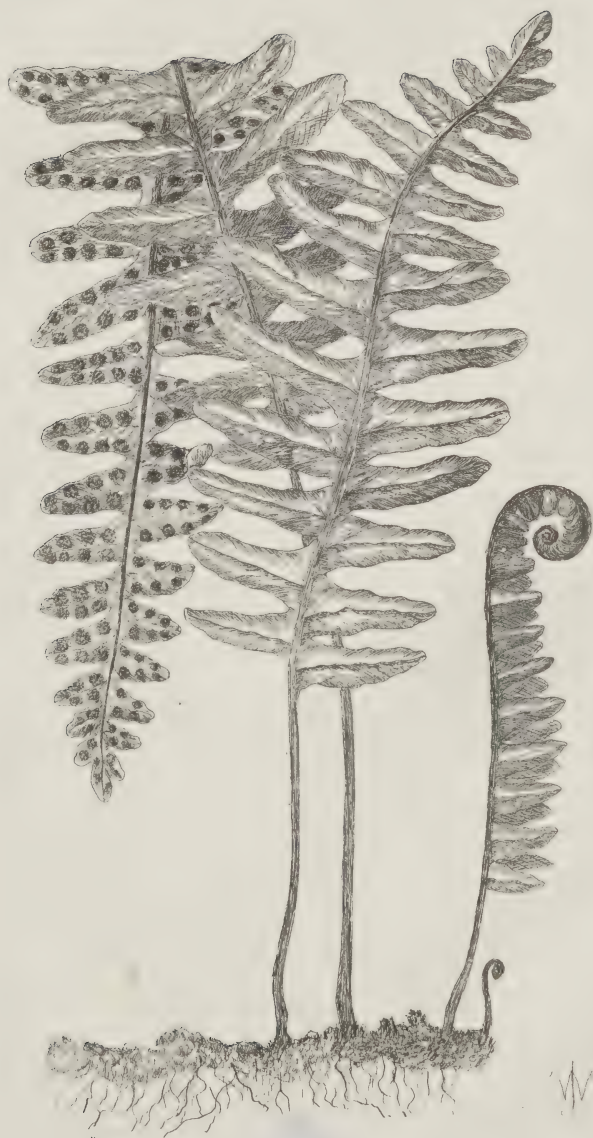


PLATE II.

POLYPODIUM INCANUM. SWARTZ.

GRAY POLYPODY—SCALY POLYPODY—RESURRECTION FERN.

Fronds evergreen and coriaceous, oblong, 2 to 6 inches high, grayish and scurfy underneath with peltate scales, simply pinnatifid; the divisions oblong-linear, obtuse; fruit-dots rather small, near the margin.—*Gray's Manual*.

On trunks of trees and on old roofs, more rarely on rocks.—*Eaton's Ferns of N. A.*

This fern is very abundant in the Southern States, where it luxuriates principally on the liveoaks. It is occasionally found in Ohio, Indiana, and Illinois. In Kentucky it is quite common. In Oldham County I counted fifty trees (the majority sycamore) with this fern growing in the greatest luxuriance, some fronds being seven inches long. A characteristic feature of this fern is in its tenacity of life. After being exposed to long drought it curls up and seems dead, but upon the application of water it soon revives; hence the name Resurrection Fern.



PLATE III.

CHEILANTHES ALABAMENSIS. KUNZE.

ALABAMA LIP-FERN.

Sub-tufted; the short rhizomes thickly clothed with very fine brown scales with attenuated hair-like apices, and passing gradually into a brighter-colored wool at base of the stipes; stipes 3 to 6 inches long, terete, polished black or blackish, with slender bright reddish-brown scales and wool below, generally smoothish or sparingly tomentose above, sometimes clothed with a soft woolly pubescence; fronds 3 to 6 inches, or more, in length, 1 to 1½ inches broad, lanceolate, pinnately-pinnatifid above, bipinnate below, green and glabrous both sides, or *sometimes with a scattered fine glandular pubescence on the face*; main rachis black, and, as well as the lower part of the secondary rachises, covered with a close rusty pubescence on the upper side only, smooth beneath; pinnæ numerous, approximate, lanceolate, very nearly an exact reproduction of the frond in outline, the upper ones deeply pinnatifid with the segments obliquely decurrent on the winged rachis, lower ones pinnate; pinnules unequally oblong, and either entire, auriculately incised at the base on the side toward the apex of the pinnæ, or pinnatifidly cut into one or more pair of short lobes or teeth, oftenest incised only once or twice on the outer side; involucres membranaceous, continuous, formed by the revolute margins, and interrupted only by the incisions of the segments.—*George E. Davenport, for Fern Etchings.*

Cumberland Gap, Ky.—*R. H. Wildberger.*



PLATE IV.

CHEILANTHES VESTITA. SWARTZ.

CLOTHED LIP-FERN.

Fronds 6 to 15 inches high, lanceolate-oblong, hirsute, as are the brown and shining stipes, with straightish prominently-articulated rusty hairs, twice pinnate.—*Gray's Manual*.

Clefts and edges of rocks from New York westward to Illinois, Missouri, and Kansas, and southward to the Carolinas.—*Eaton's Ferns of N. A.*

In the year 1878 I found this fern quite plentiful on all the high ranges near Irvine, in Estill County, Kentucky. This plant seems to have the same nature as the *Polypodium incanum*. It was dried and shriveled up with the long drought; by moistening the plants they soon revived, and made very good herbarium specimens,



PLATE V.

CHEILANTHES LANUGINOSA. NUTTALL.

WOOLLY LIP-FERN.

Stipes slender, at first hairy, black or brown, shining; fronds 3 to 6 inches high, ovate-lanceolate, woolly with soft whitish distinctly-articulated flattened hairs, becoming smoother above, twice or thrice pinnate; pinnæ 5 to 6 lines long, ovate, the lowest distant, the others contiguous; pinnules crenately pinnatifid, or mostly divided into minute and roundish densely-crowded segments $\frac{1}{2}$ to 1 line long, the herbaceous margins recurved, forming an almost continuous involucre.—*Gray's Manual*.

In the United States, from Illinois and Wisconsin to Utah, Colorado, New Mexico, and Arizona, it grows in dense tufts on dry exposed rocks and cliffs.—*Eaton's Ferns of N. A.*



PLATE VI.

CHEILANTHES TOMENTOSA. LINK.

WEBBY LIP-FERN.

Fronds 12 to 20 inches high, lanceolate-oblong, densely tomentose, with slender and entangled whitish obscurely-articulated hairs, thrice pinnate; primary and secondary pinnæ oblong or ovate-oblong; pinnales distinct, minute, $\frac{1}{2}$ to 1 line long, roundish-obovate, sessile, or adnate-decurrent, the upper surface less woolly, the reflexed narrow margin forming a continuous somewhat membranaceous involucre.—*Gray's Manual*.

Sandstone rocks along the French Broad River in North Carolina and eastern Tennessee.—*Eaton's Ferns of N. A.*

In Gray's Manual this fern is reported as having been found in Kentucky, and on that authority I included it in "Ferns of Kentucky," page 49, plate XI, but I have so far failed, either personally or by correspondence, to locate this fern in Kentucky.



PLATE VII.

CRYPTOGRAMME ACROSTICHOIDES. R. BR.

PARSLEY FERN.

Stipes densely tufted, straw-colored; fronds, two to three pinnate, 6 to 10 inches high; fertile segments stalked, linear or linear-oblong, 3 to 5 lines long; sterile fronds on much shorter stipes, with ovate or obovate-decurrent and crenately-toothed or incised segments. Isle Royale, Lake Superior, thence westward and northward.—*Gray's Manual.*



PLATE VIII.

PELLÆA GRACILIS. HOOKER.

SMALL CLIFF-BRAKE.

Smooth, low, 3 to 6 inches high; fronds thin, of few pinnæ, which are pinnately parted into three to five oblong or linear-oblong somewhat crenate divisions, or in the sterile frond ovate. Shaded rocks; Vermont to Michigan. Rare. July.—*Gray's Manual*,

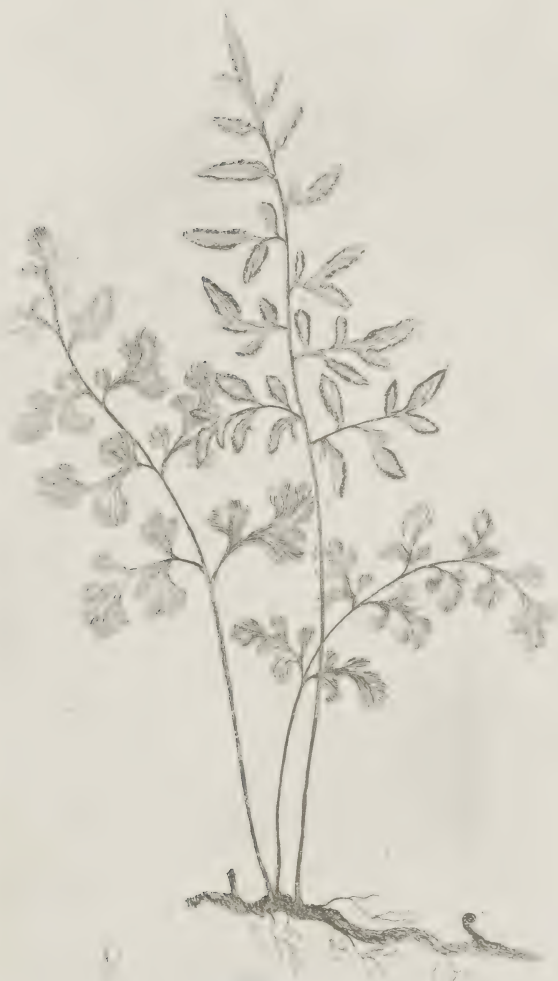


PLATE IX.

PELLÆA ATROPURPUREA. LINK.

BLACK-STEMMED CLIFF-BRAKE.

Stalk of the simply- or somewhat doubly-pinnate pale frond 6 to 15 inches high, dark purple and shining; pinnæ, or their three to seven divisions below, oblong or linear, entire, obliquely truncate or heart-shaped at stalked base. Sterile sometimes oval, chiefly entire. —*Gray's Manual*.

Very common on limestone rocks in Kentucky.

A beautiful specimen of this fern was sent to me by Mr. W. H. Linney, of Boyle County, Ky., that measured 18 inches long.



PLATE X.

PTERIS AQUILINA. LINNÆUS.

COMMON BRAKE.

Fronde ternate at summit of an erect stout stalk, 1 to 2 feet high, the widely-spreading branches two-pinnate; pinnules oblong-lanceolate, the upper undivided, the lower more or less pinnatifid, with oblong-obtuse lobes, margined all round with the indusium. Thickets and stony hills every where. August. Whole frond, 2 to 3 feet wide; dull green.—*Gray's Manual*.





PLATE XI.

ADIANTUM PEDATUM. LINNÆUS.

Fronde forked at the summit of the upright slender stalk, 9 to 15 inches high, the forks pedately branching from one side into several slender spreading divisions, which bear numerous triangular-oblong and oblique short-stalked pinnules; these are as if halved, being entire on the lower margin, from which the veins all proceed, and terminate in the cleft and fruit-bearing upper margin. Rich, moist woods. July. A delicate and most graceful fern.—*Gray's Manual*,



[FRONTISPIECE.]

ADIANTUM CAPILLUS-VENERIS. L.

VENUS HAIR. MAIDEN HAIR.

Rootstock creeping, scaly; stalks crowded, a few inches to a foot long, very slender, black and shining, as are the rachis and all its divisions; fronds a span to a foot and a half long, often pendent, ovate or ovate-lanceolate in outline, delicately membranaceous, smooth, simply pinnate toward the apex, below twice or even thrice pinnate; pinnules and upper pinnæ six to twelve lines long, wedge-obovate or somewhat rhomboid, rather long-stalked, the sides straight or slightly concave, the upper margin often deeply and irregularly incised; the ends of the lobes crenate or acutely denticulate, except where the margin is recurved to form the lunulate or transversely oblong separated involucre.

In moist, rocky places, especially about springs and along water-courses, from Wilmington, North Carolina, to Florida, Alabama, and the southern part of California.—*D. C. Eaton, in Ferns of N. A.*

This beautiful fern has recently been found in the mountains of Virginia on the banks of the New River, Wythe County, by Mr. Howard Shriver. 1878.

This etching was made from a plant collected by Miss Windle in San Bernardino, California.

PLATE XII.

WOODWARDIA ANGUSTIFOLIA. SMITH.

CHAIN FERN.

Fronds pinnatifid, sterile ones 12 to 18 inches high, with lanceolate serrulate divisions united by a broad wing; fertile fronds taller, with narrowly linear almost disconnected divisions, the areoles and fruit-dots 4 to 5 lines long, in a single row, each side of the secondary midribs. Bogs, Massachusetts, near the coast, to Virginia, and southward. August and September,—*Gray's Manual*.



PLATE XIII.

WOODWARDIA VIRGINICA. SMITH.

Fronds 2 to 3 feet high, pinnate, with numerous lanceolate pinnatifid pinnæ; segments oblong; veins forming a row of narrow areoles along the midrib both of the pinnæ and of the lobes, the outer veinlets free; fruit-dots oblong, one to each areole, confluent when ripe. Wet swamps, Maine to Virginia, and southward. July.—*Gray's Manual,*



PLATE XIV.

SCOLOPENDRIUM VULGARE. SMITH,

HART'S-TONGUE FERN.

Frond simple, rarely two-forked at the apex, oblong-lanceolate from an auricled heart-shaped base, entire or wavy margined, 7 to 18 inches long, 1 to 2 inches wide, bright green. Limestone rocks, in a deep ravine at Chittenango Creek, N. Y., below the falls. July, August.—*Gray's Manual*.

I am indebted to Mr. D. A. P. Watt, of Montreal, Canada, for specimens from which I made the illustration,



PLATE XV.

CAMPTOSORUS RHIZOPHYLLUS. LINK.

WALKING-LEAF FERN.

Fronds evergreen, growing in tufts, spreading or procumbent, 4 to 12 inches long, lanceolate from an auricled heart-shaped base, entire or wavy on the margin, tapering above into a slender prolongation like a runner, which often roots at the apex, and gives rise to new fronds, and these in turn to others; hence the popular name.—*Gray's Manual*.

Common in the Western States, on limestone or sandstone rocks, but found very rarely with elongated auricles.

Mr. Linney, of Harrodsburg, Ky., informs me that he has found this fern on two occasions growing on the trunks of trees, the roots being imbedded in the moss.



PLATE XVI.

ASPLENIUM PINNATIFIDUM. NUTTALL.

PINNATIFID SPLEENWORT.

Fronds 3 to 6 inches long, diffusely spreading, lanceolate, pinnatifid, sometimes pinnately parted near the base, tapering above into a slender prolongation, with the apex sometimes rooting; lobes roundish-ovate, obtuse, cut-toothed, or nearly entire. Fronds evergreen. Rare in the Eastern States.—*Gray's Manual*.

Common in the sandstone regions of Kentucky and Indiana.

This fern is very variable, some fronds fully fruited with simple outline, not over 1 inch long, others deeply pinnatifid, and 7 inches in length,



PLATE XVII.

ASPLENIUM EBENOIDES. R. R. SCOTT.

SCOTT'S SPLEENWORT.

Fronde 4 to 9 inches long, broadly lanceolate, pinnatifid, pinnate near the base; crenate, some of them elongated and often proliferous, as is the apex of the frond; stalk, blackish and shining.—*Eaton's Ferns of N. A.*

Limestone cliffs on the Schuylkill River near Philadelphia. This illustration was drawn from a plant found by Prof. Wildberger in Franklin County, Ky., 1878.



PLATE XVIII.

ASPLENium EBENEUM. AITON.

EBONY SPLEENWORT.

Fronds upright, 8 to 16 inches high, pinnate lance-linear in outline; pinnæ $\frac{1}{2}$ to 1 inch long, many lanceolate, or the lower oblong, slightly scythe-shaped, finely serrate, sessile, the dilated base auricled on the upper or both sides; fruit-dots numerous on both sides of the elongated midrib; stalk and rachis blackish-purple and shining. Rocky, open woods, common southward. July and August.—*Gray's Manual*.

Mr. Eugene A. Rau sends me a curious form of this fern; about 4 inches from the apex it bifurcates; both divisions are heavily fruited.



PLATE XIX.

ASPLENIUM PARVULUM. MARTENS AND
GALEOTTI.

LITTLE EBONY SPLEENWORT.

Root-stock short, creeping; the scales nearly black, very opaque and rigid; stalks short, black, and shining, like the rachis; fronds erect, rigid, 4 to 10 inches high; narrowly linear, oblanceolate pinnate; pinnæ numerous, nearly sessile, more or less deflexed, 2 to 6 lines long; oblong, obtuse, entire, or crenulate; sori oblong midway between the midrib and the margin.—*Eaton's Ferns of N. A.*

Shaded rocks, generally limestone. Alabama, Tennessee, Cumberland Gap, Ky.—*Prof. Wildberger*. Estill County, Ky.—*J. W.*, 1878.



PLATE XX.

ASPLENIUM TRICHOMANES. LINNÆUS.

MAIDEN-HAIR SPLEENWORT.

Fronde 3 to 8 inches long, in dense spreading tufts, linear in outline, pinnate; pinnæ numerous, roundish, oblong, or oval, 3 to 4 lines long, unequal-sided, obliquely wedge-truncate at the base, attached by a narrow point, the midrib evanescent; the thread-like stalk and rachis purple-brown and shining. Shaded sandstone cliffs; common, July.—*Gray's Manual*.





PLATE XXI.

ASPLENIUM VIRIDE. HUDSON.

GREEN SPLEENWORT.

Root-stock short, creeping, entangled, and forming large tufts; stalks brownish at the base, becoming greenish higher up, and passing into a green herbaceous rachis; fronds 2 to 5 inches long, linear-lanceolate, softly herbaceous; bright green pinnate; pinnæ roundish-ovate, cuneate at the base.—*Eaton's Ferns of N. A.*

Rare, Smugglers' Notch, Vt.—*C. G. Pringle.*



PLATE XXII.

ASPLENIUM MONTANUM. WILLDENOW.

MOUNTAIN SPLEENWORT.

Fronds 3 to 7 inches high, bright green, ovate-lanceolate or triangular-oblong in outline, pinnate; the ovate pinnae pinnately three- to seven-parted (or the upper barely cleft) and cut-toothed; the veins forking from a midrib. Cliffs, Alleghany Mountains in Pennsylvania. July. Rachis green; stalk brownish.—*Gray's Manual*.

Very common on sandstone rocks in the mountain regions of Kentucky.



PLATE XXIII.

ASPLENIUM BRADLEYI. D. C. EATON.

BRADLEY'S SPLEENWORT.

Mature plant 8 to 10 inches high; root-stock short, covered with narrow, acuminate fuscous-black scales; stipes tufted, slender, ebenous, as in the lower half or two thirds of the rachis; fronds membranaceous, oblong-lanceolate, varying to linear-oblong, the largest ones 5 to 7 inches long, and $1\frac{1}{2}$ to 2 inches broad, pinnate; pinnae rather numerous, 8 to 12 pairs, the lower ones more distant than the median ones, and of similar size, all short-stalked, oblong-ovate, obtuse or acutish, more or less incised, in the largest, pinnatifid with oblong lobes which are toothed at the apex, in the smallest, deltoid-ovate, slightly toothed; fruit-dots near the costules; indusium delicate.—*D. C. Eaton, Bull. Torr. Bot. Club, vol. iv, p. 11.*

I found a few plants of this fern growing in a very exposed situation on a high bluff of sandstone in Estill County, Ky., August, 1878. The *A. ebenum* and *Camptosorus rhizophyllus* were found associated with it.

While botanizing in Laurel County, Kentucky, last October I was again successful in finding another locality, but instead of the *Camptosorus* and *A. ebenum* I found the *A. montanum* and *A. pinnatifidum* growing on the same rock.



PLATE XXIV.

ASPLENIUM RUTA-MURARIA.

WALL-RUE SPLEENWORT.

Fronds 2 to 4 inches long, two pinnate below, simply pinnate above, ovate in outline, the few divisions narrowly rhombic-wedge-shaped, toothed at the apex, without a midrib, the veins all rising from the base. Limestone cliffs; rare. July.—*Gray's Manual*.

This fern has a strong affinity for limestone. In Estill County, Ky., I visited a locality of peculiar geological formation. The lower strata was pure shale. The out-cropping rock was limestone and the high knob was capped with sandstone. In some places the sandstone and limestone came very close together, but I did not find a single plant of *A. Ruta-muraria* or *Pellæa atropurpurea* growing on the sandstone, but both quite plentiful on the limestone. The *Camp-tosorus* and *A. ebeneum* were about equally distributed on lime and sandstone,



PLATE XXV.

ASPLENIUM ANGUSTIFOLIUM.

NARROW-LEAVED SPLEENWORT.

Fronds 2 to 3 feet high, thin, simple pinnate; pinnæ numerous, short-stalked, linear-lanceolate, acuminate, entire, or crenulate, 3 to 4 inches long, those of the fertile frond narrower; fruit-dots linear, 20 to 40 each side the mid-vein. Rich woods, west New England to Wisconsin, and southward along the mountains.—*Gray's Manual*.

The sterile fronds are fully developed in June and July, the long, narrow fertile fronds in August and September.



PLATE XXVI.

ASPLENium THELYPTEROIDES. MICHX.

MARSH SPLEENWORT.

Fronds 2 to 3 feet high, pinnate, pinnæ deeply pinnatifid, linear-lanceolate, 3 to 5 inches long, the lobes oblong, obtuse, minutely toothed, crowded, each bearing 3 to 6 pairs of oblong fruit-dots. Rich woods; very common in Kentucky. Fruit fully developed in August.—*Gray's Manual*.



PLATE XXVII.

ASPLENIUM FILIX-FŒMINA. BERNHARDI.

LADY FERN.

Fronds 1 to 3 feet high, ovate-oblong or broadly lanceolate, twice pinnate; pinnæ lanceolate, numerous; pinnules confluent on the secondary rachis by a narrow margin, oblong and doubly serrate, or elongated and pinnately incised, with cut-toothed segments; fruit-dots short, variously curved, at length confluent. Moist woods; common and very variable. July.—*Gray's Manual*.

A very beautiful form of this fern, with purple stem, is often found in deep, rich woods,



PLATE XXVIII.

PHEGOPTERIS POLYPODIOIDES. FEE.

BEECH FERN.

Fronde triangular, longer than broad, 4 to 9 inches long, hairy on the veins, especially beneath; pinnæ linear-lanceolate; the lowest pair deflexed and standing forward; their divisions oblong, obtuse, entire, the basal ones decurrent and adnate to the main rachis; fruit-dots all near the margin. Damp woods; common northward. Root-stock slender, creeping, bearing a few distant slender stalks, rather longer than the fronds. July.—*Gray's Manual*.





PLATE XXIX.

PHEGOPTERIS HEXAGONOPTERA. FEE.

HEXAGON BEECH FERN.

Fronds triangular, usually broader than long, 7 to 12 inches broad, slightly pubescent and often finely glandular beneath; pinnae lanceolate; upper segments oblong, obtuse, toothed or entire; those of the very large lowest pinnae elongated and pinnately lobed, basal ones very much decurrent and forming a continuous many-angled wing along the main rachis; fruit-dots near the margin. Larger and broader than the last, which it often closely resembles. Very common in rich woods, especially in the Middle and Southern States,—*Gray's Manual*.



PLATE XXX.

PHEGopteris Dryopteris. Fee.

OAK FERN.

Stalk slender and brittle, smooth; frond smooth, pale light green, 4 to 6 inches wide; the three principal divisions widely spreading, the ultimate ones oblong, obtuse, nearly entire; fruit-dots marginal; rocky woods; common northward.—*Gray's Manual*.



PLATE XXXI.

ASPIDIUM LONCHITIS. SWARTZ.

ALPINE SHIELD FERN. HOLLY FERN.

Fronds linear-lanceolate, 9 to 20 inches high, scarcely stalked, very rigid; pinnæ broadly lanceolate scythe-shaped, or the lowest triangular, strongly auricled on the upper side and wedge-truncate on the lower, densely spinulosed-toothed, one inch or less in length, copiously fruit-bearing; fruit-dots contiguous and near the margin. — *Gray's Manual*.

Woods, southern shore of Lake Superior, and northward. — *D. A. P. Watt*.



PLATE XXXII.

ASPIDIUM ACROSTICHOIDES. SWARTZ.

CHRISTMAS FERN.

Frond lanceolate, 1 to 2 feet high, stalked; pinnæ linear-lanceolate, somewhat scythe-shaped, half halbert-shaped at the slightly-stalked base, serrulate with appressed bristly teeth; the fertile (upper) ones contracted and smaller, bearing contiguous fruit-dots near the midrib, which are confluent with age, and cover the surface. Very common.—*Gray's Manual*.



PLATE XXXIII.

ASPIDIUM ACULEATUM.

VAR. BRAUNII, KOCH.

SOFT PRICKLY SHIELD FERN.

Frond spreading, $1\frac{1}{2}$ to 2 feet long, oblong-lanceolate in outline, with a tapering base, the lower of the many pairs of oblong-lanceolate pinnæ gradually reduced in size and obtuse; pinnules ovate or oblong, obtuse, truncate or almost rectangular at the base, short stalked, or the upper confluent, sharply toothed, beset with long and soft as well as chaffy hairs. Deep woods, mountains of New Hampshire and Vermont.—*Gray's Manual*.

Smugglers' Notch, Vt.—*Lyman H. Hoysradt*.



PLATE XXXIV.

ASPIDIUM THELYPTERIS. SWARTZ.

MARSH SHIELD FERN.

Fronde pinnate, lanceolate in outline; the horizontal pinnæ gradually diminishing in length from near the base to the apex, sessile, linear lanceolate, deeply pinnatifid, lobes oblong, entire, obtuse or appearing acute when in fruit, from the strongly revolute margins, veins mostly forked, bearing the crowded fruit-dots (soon confluent) near their middle. Marshes; common. Fruit fully developed in August and September.—*Gray's Manual*,



PLATE XXXV.

ASPIDIUM NOVEBORACENSE. SWARTZ.

NEW YORK SHIELD FERN.

Fronds pinnate, lanceolate in outline, tapering both ways from the middle; pinnæ lanceolate, the two or more lowest pairs gradually shorter and deflexed; lobes flat, oblong, basal ones often enlarged and incised; veins simple, or forked in the basal lobes; fruit-dots distinct, near the margin; indusium minute; margin glanduliferous. Swamps and moist thickets; common. July. Frond pale green, delicate and membranaceous, hairy beneath along the midribs and veins. *Gray's Manual,*



PLATE XXXVI.

ASPIDIUM FRAGRANS. SWARTZ.

FRAGRANT WOOD FERN.

Fronds 4 to 10 inches high, glandular and aromatic, narrowly lanceolate, with linear-oblong pinnately-parted pinnæ; their divisions 2 lines long, oblong, obtuse, toothed or nearly entire, nearly covered beneath with the very thin imbricated indusia; root-stock stout and densely chaffy, as are the stipes and rachis.—*Gray's Manual*.

Crevices of shaded cliffs and on mossy rocks from New Foundland and northern New England to Wisconsin, and north to Arctic America.—*Eaton's Ferns of N. A.*



PLATE XXXVII.

ASPIDIUM SPINULOSUM. SWARTZ.

SPINY SHIELD FERN.

Fronds 1 to 3 feet high, stipes clothed with pale or dark brown scales; fronds usually of a light (yellowish) green, sometimes dark, varying from ovate-lanceolate to triangular-ovate, twice or thrice pinnate; pinnæ arranged obliquely on the rachis, the lowest pairs unequally triangular-ovate or sub-deltoid, usually shorter and more oblique than those immediately above; lower pinnules often greatly elongated; under surface smooth; indusium naked. Massachusetts, New York.—*George E. Davenport, Am. Nat., vol. xii, p. 713.*

I collected a few specimens of this fern July, 1879, in Coon's Woods, twelve miles from Louisville.



PLATE XXXVIII.

ASPIDIUM SPINULOSUM. VAR. INTERMEDIUM,

D. C. EATON.

Fronde 1 to 3 feet high, scales of the stipe few, brown, with a dark center, frond broadly oblong-ovate, twice or often thrice pinnate; pinnae spreading, oblong-lanceolate, the lower ones unequally triangular-ovate; pinnules crowded, ovate-oblong, spreading, pinnately divided, the oblong lobes spinulose-toothed at the apex.

Margins of the indusium denticulate and beset with minute-stalked glands. Common. July.—*Gray's Manual*.





PLATE XXXIX.

ASPIDIUM BOOTTII. TUCKERMAN.

Fronds 1 to 3 feet high, scales of the stipe pale brown; frond elongated-oblong or elongated lanceolate in outline, pinnule broadly oblong, very obtuse, the lower pinnatifid, the upper and smaller merely serrate, indusium minutely glandular.—*Gray's Manual*,

Middlesex County, Mass.



PLATE XL.

ASPIDIUM CRISTATUM. SWARTZ.

CRESTED SHIELD FERN.

Frond linear-oblong in outline, 1 to 2 feet long, and very long-stalked; pinnæ short, triangular-oblong, or the lowest nearly triangular-ovate, from a somewhat heart-shaped base; acute, deeply pinnatifid; the divisions, six to ten pairs, oblong, very obtuse, finely serrate or cut-toothed; fruit-dots as near the mid-vein as the margin; indusium round-reniform; the stipes and stout creeping root-stock bearing broad and deciduous chaffy scales.—*Gray's Manual*.

Swamps; common in the Eastern States, but rare in Kentucky. Swamps at Prospect, Oldham County, Ky.



PLATE XLI.

ASPIDIUM GOLDIANUM. HOOKER.

GOLDIE'S SHIELD FERN.

Fronds broadly ovate, or the fertile ovate oblong in outline, 2 to 3 feet long; pinnae 6 to 9 inches long, oblong-lanceolate; broadest in the middle, pinnately parted; the divisions, about twenty pairs, oblong-linear, slightly scythe-shaped, 9 to 15 lines long; serrate with appressed teeth; veins pinnately forking, and bearing the fruit-dots very near the mid-vein; indusium very large, orbicular with a deep narrow sinus, smooth, and without marginal glands.—*Gray's Manual*.

Rich and moist woods from Connecticut to Kentucky. Fruit developed in July.



PLATE XLII.

ASPIDIUM FILIX-MAS. SWARTZ.

MALE FERN.

Fronde lanceolate in outline, 1 to 3 feet high; pinnæ linear-lanceolate, tapering from base to apex; pinnules oblong, very obtuse, serrate at the apex, and obscurely so at the sides, the basal ones incisely lobed, distinct, the upper confluent; fruit-dots nearer the mid-vein than the margin, and usually confined to the lower half of each fertile pinnule.—*Gray's Manual*.

Rocky woods, Keweenaw Peninsula, Lake Superior.—*D. A. P. Watt*.



PLATE XLIII.

ASPIDIUM MARGINALE. SWARTZ.

MARGINAL SHIELD FERN.

Fronde evergreen, smooth, thickish, and almost coriaceous, ovate-oblong in outline, 2 feet high; pinnæ lanceolate, broadest above the base; pinnules oblong or oblong scythe-shaped, crowded, obtuse, entirely or crenately toothed; fruit-dots near the margin. Very common. August.—*Gray's Manual*.

This fern is readily distinguished by the dark-green upper surface of the frond, and the pale-green under surface, also the well-marked rows of fruit-dots close to the margin.



PLATE XLIV.

STRUTHIOPTERIS GERMANICA. WILLD.

OSTRICH FERN.

Sterile fronds smooth, broadly lanceolate, the lowest pinnæ gradually much smaller; pinnæ very numerous, narrowly lanceolate, deeply pinnatifid; the lobes oblong, obtuse; the fertile frond with somewhat necklace-shaped pinnæ, the lowest ones much smaller. Named from the plume-like arrangement of the divisions of the fertile frond. Alluvial soil. Northward.—*Gray's Manual*,



PLATE XLV.

ONOCLEA SENSIBILIS. LINNÆUS.

SENSITIVE FERN.

Fertile frond twice pinnate and much contracted; the pinnules short and revolute, usually rolled up so as to be converted into berry-shaped closed involucre, filled with sporangia, and forming a one-sided spike or raceme. Sterile fronds rising separately from the naked, extensively-creeping root-stock, long-stalked, broadly triangular in outline, deeply pinnatifid into lance-oblong pinnæ, which are entire or wavy-toothed. August and September. — *Gray's Manual*.

This fern is found very common in swamps and marshy ground in Kentucky; from the extensively-creeping root-stock it forms great beds. A gentleman who is fond of ferns planted a few roots of the *Onoclea* in his garden with other ferns; in a few seasons the *Onoclea* spread very rapidly, and has now nearly monopolized all the ground set apart for ferns in the garden.



PLATE XLVI.

CYSTOPTERIS FRAGILIS. BERNHARDI.

FRAGILE BLADDER FERN.

Fronde oblong-lanceolate, 4 to 16 inches long, two to three pinnate; the pinnæ and pinnules ovate or lanceolate in outline, irregularly pinnatifid or cut-toothed, mostly acute, decurrent on the margin or winged rachis; very common and very variable.—*Gray's Manual*.

In the deep, rich woods of Kentucky this fern is found in great abundance, especially in early spring, but being so delicate the fronds very soon die, not being able to stand the struggle for existence with the surrounding vegetation. The long and scaly root-stock is, however, tenacious of life,



PLATE XLVII.

CYSTOPTERIS BULBIFERA. BERNHARDI.

BULBOUS BLADDER FERN.

Fronds lanceolate, elongated, 1 to 2 feet long, two-pinnate; the pinnæ lanceolate-oblong, pointed, horizontal, 1 to 2 inches long; the rachis and pinnæ often bearing bulblets underneath, wingless; pinnales crowded, oblong, obtuse, toothed or pinnatifid. July.—*Gray's Manual*.

This fern is not so variable as the last; a form with beautiful purple stems is often found. A curious character of the unfolding of the frond is worthy of notice. I have seen fronds over two feet in length, with the lower pinnæ fully developed and the apex still unfolding their circinate coil. Prof. Wildberger sends me a specimen with four of the bulbs sending out new rootlets and fronds.



PLATE XLVII.—A.

CYSTOPTERIS MONTANA. BERNHARDI.

MOUNTAIN BLADDER FERN.

Fronde triangular, short, on a long slender stipe, tripennate; pinnæ and pinnules spreading; ultimate pinnules narrow, oblong, inciso-dentate or pinnatifid; the segments toothed at the apex; rachis not winged; involucre sub-rotund, very obtuse.—*Hook. Sp. Fil.*

Lake Superior.—*D. A. P. Watt.*



PLATE XLVIII.

WOODSIA ILVENSIS. ROBERT BROWN.

ELBA WOODSIA.

Fronde oblong-lanceolate, 2 to 6 inches long by 1 inch wide, smoothish and green above, thickly clothed underneath as well as the stalk with rusty bristle-like chaff, pinnate; the pinnæ crowded, oblong, obtuse, sessile, pinnately parted, the numerous crowded pinnules oblong, obtuse, obscurely crenate, almost coriaceous; the fruit-dots near the margin, somewhat confluent when old. Exposed rocks, frequent. June, Alleghanies.—*Gray's Manual*.



PLATE XLIX.

WOODSIA HYPERBOREA. R. BROWN.

ROUND-LEAVED WOODSIA.

Fronde lanceolate-pinnate; pinnæ ovate cordate, inciso-pinnatifid, hairy beneath; sori solitary, at length confluent.

Vermont.—*Horace Mann, C. G. Pringle.*



PLATE L.

WOODSIA GLABELLA. ROBERT BROWN.

SMOOTH WOODSIA.

Smooth and naked throughout; fronds linear, 2 to 5 inches high; pinnate; pinnæ roundish or ovate, 2 to 4 lines long, cut into three to seven roundish or somewhat wedged-shaped lobes; stipes obscurely jointed near the base. Shaded cliffs at Little Falls, N. Y.—*Ben. D. Gilbert*.



PLATE LI.

WOODSIA OREGANA. D. C. EATON.

OREGON WOODSIA.

Smooth, with fronds 2 to 8 inches high, 8 to 12 lines wide, elliptical-lanceolate, pinnate, the fertile ones tallest; pinnæ triangular-oblong, obtuse, pinnatifid; segments oblong or ovate, obtuse, finely toothed, and in larger fronds incised; fruit-dots near the margin.—*Gray's Manual*.

Crevices of rocks, south shore of Lake Superior.—*D. P. A. Watt*,



PLATE LII.

WOODSIA OBTUSA. TORREY.

OBTUSE-LEAVED WOODSIA.

Frond broadly lanceolate, minutely glandular-hairy, 6 to 12 inches high, pinnate; the pinnae rather remote, triangular-ovate or oblong, 1 to 2 inches long, bluntish, pinnately parted; pinnules oblong, very obtuse, crenately pinnatifid-toothed, with a single smooth fruit-dot on each rounded minutely-toothed lobe near the sinus; stalk and rachis a little chaffy. July.—*Gray's Manual*.



PLATE LIII.

DICKSONIA PUNCTILOBULA. KUNZE.

Minutely glandular and hairy, 2 to 3 feet high, fronds ovate-lanceolate and pointed in outline, pale green, very thin, with strong chaffless stalks rising from slender extensively-creeping naked root-stalks, mostly bipinnate; primary pinnae lanceolate, pointed; secondary pinatifid into oblong and obtuse cut-toothed lobes; fruit-dots minute, each on a recurved toothlet, usually one on the upper margin of each lobe.—*Gray's Manual*.

Common in the Eastern States, but found in Indiana and Kentucky. In the latter-named state I found this fern very plentiful, in Estill County, August, 1878, growing in large beds in the loose shaly rocks.



PLATE LIV.

TRICHOMANES RADICANS. SWARTZ.

BRISTLE FERN.

Root-stock slender, widely creeping; fronds very delicate, pellucid, smooth, borne on short-winged stalks, lanceolate or ovate-lanceolate, 4 to 8 inches high, 16 to 18 lines broad; bipinnatifid rachis winged throughout; pinnæ triangular, ovate, obtuse, the upper side of the base closely parallel to the rachis, the lower crenate divisions toothed, or divided into linear lobes; involucre usually terminal on the lowest superior lobe of a division, or on several lobes, tubular funnel-form margined, truncate at the mouth and slightly two-lipped; columella bristle-like, rising from the bottom of the involucre, more or less exserted, the included portion bearing the sporangia. On shaded and overhanging sandstone cliffs; Alabama, Tennessee, and Kentucky. This delicate fern is in its greatest beauty in October and November, —*Eaton's Ferns of N. A.*



W. H. M.

PLATE LV.

SCHIZÆA PUSILLA. PURSH.

NEW JERSEY SCHIZÆA.

Sterile fronds linear-thread form, simple, tortuous, much shorter than the stalk of the fertile, which bears about five pairs of short crowded pinnæ at its apex. Low grounds; pine barrens of New Jersey; rare. A delicate little plant, 3 to 4 inches high.—*Gray's Manual.*

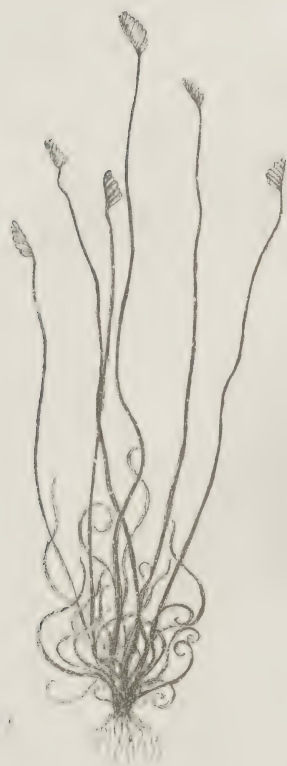


PLATE LVI.

LYGODIUM PALMATUM. SWARTZ.

CLIMBING FERN.

Very smooth; stalks slender, flexile and twining, 1 to 5 feet long, from slender running root-stocks; the short alternate branches or petioles deeply two-forked, each fork bearing a rounded heart-shaped palmately four-to-seven-lobed sterile frondlet; fertile frondlets above, all contracted and several times forking, forming a compound terminal panicle. Shaded, moist banks; eastern New England to Pennsylvania and Kentucky.—*Gray's Manual*. July. It is found quite frequently growing in isolated patches in the latter state.



PLATE LVII.

OSMUNDA REGALIS. LINNÆUS,

ROYAL FLOWERING FERN.

Very smooth, pale, 2 to 4 feet high; sterile pinnules, twenty or more, lance-oblong, rather oblique but not auricled at the base, 2 inches long; the fertile forming an oblong racemose panicle at the summit of the frond. Swamps; common. May and June.—*Gray's Manual*.



PLATE LVIII.

OSMUNDA CLAYTONIANA. LINNÆUS.

CLAYTON'S FLOWERING FERN.

Clothed with loose wool when unfolding, soon perfectly smooth; 2 to 3 feet high; pinnæ oblong-lanceolate, with oblong, obtuse divisions; some, two to five pairs, of the middle pinnæ fertile, these entirely pinnate; sporangia brownish. Low grounds; common. May. Fruiting as it unfolds.—*Gray's Manual*.



PLATE LIX.

OSMUNDA CINNAMOMEA. LINNÆUS.

CINNAMON FLOWERING FERN.

Clothed with rusty wool when young; sterile fronds smooth when full grown; the lanceolate pinnæ pinnatifid into broadly oblong-obtuse divisions; fertile fronds separate, contracted, two-pinnate, entirely covered, or nearly so, with the cinnamon-colored sporangia. Fertile spike fully developed in June.—*Gray's Manual*,



PLATE LX.—A.

BOTRYCHIUM SIMPLEX. HITCHCOCK.

HITCHCOCK'S MOONWORT.

Plants smooth, fleshy, not often over 6 inches high; sterile segment petioled, set near the base of the plant, rarely above the middle, varying from simple and roundish obovate in small plants to triangular-ovate and deeply lobed, or even fully ternate with incised divisions in more developed forms; segments broadly obovate, cuneate, or slightly lunate, the outer margin obscurely crenulate, sometimes lobed; veining flabellately forking; fertile segment once or twice forking.—*Eaton's Ferns of N. A.*, p. 123.

North shore of Lake Superior, Berlin, Mass.—*George E. Davenport.*

PLATE LX.—B.

BOTRYCHIUM LUNARIA. SWARTZ.

MOONWORT.

Plant smooth, fleshy, commonly 4 to 10 inches high; sterile segment sessile near the middle of the plant, oblong, rarely ovate, obtuse pinnately cleft; lobes or pinnæ semi-lunar from a broadly-cuneate base, the sides concave, the outer margin rounded, entire or obscurely crenulate, rarely incised; veins flabellately forking; fertile segment twice or thrice pinnate.—*Eaton's Ferns of N. A.*, p. 29.

Michigan, New York, north shore of Lake Superior, Connecticut.



PLATE LXI.—A.

BOTRYCHIUM MATRICARIÆFOLIUM.

A. BRAUN.

MATRICARY GRAPE FERN.

Plant 2 to 12 inches high, moderately fleshy; sterile segment borne high upon the common stalk, distinctly petioled or rarely sessile, membranaceous, oblong, ovate, or even deltoid in outline, in simpler forms pinnately divided or lobed into a few nearly equal oblong or ovate or rounded entire or crenated obtuse lobes, but in larger forms twice pinnatifid; the primary divisions several pairs, the lower one largest, and all pinnatifid into oblong-ovate-toothed and obtuse lobes; mid-vein of the lobes usually distinct, and bearing on each side forking veinlets; fertile segment short-stalked, varying from a simple spike to an ample panicle of racemed sporangia.—*Eaton's Ferns of N. A.*, p. 129.

Western Vermont, Massachusetts, New York—*George E. Davenport*.

PLATE LXI.—B.

BOTRYCHIUM LANCEOLATUM. ANGSTRÆM.

LANCEOLATE GRAPE FERN. •

Plant 2 to 8 inches high, scarcely fleshy, the common stalk slender and bearing high up, near the short-stocked fruiting panicle; a sessile deltoid membranaceous once-or-twice-pinnatifid sterile segment; divisions few, oblique or somewhat spreading, oblong-lanceolate, straight, acute, the base narrowed and decurrent; lowest pairs much the longest; veins forking from a mid-vein; fertile panicle with slender branches and seldom-crowded sporangia.—*Eaton's Ferns of N. A.*

Sudbury, Massachusetts, Onedia Co., N. Y., Pennsylvania, Ohio.—*George E. Davenport*.



PLATE LXII.

BOTRYCHIUM TERNATUM. MILDE.

VAR. OBLIQUUM.

TERNATE GRAPE FERN.

Sterile portion of the frond petioled, from near the base; two to three ternate, or the ultimate divisions often pinnate or pinnately parted; broadly triangular in general outline; the lobes or divisions oblong or lanceolate, either obtuse or oblique at the base, nearly entire; toothed or irregularly-pinnatifid fertile segment twice to four times pinnate; usually taller than the sterile. July and August.—*Gray's Manual*,



PLATE LXIII.

BOTRYCHIUM TERNATUM. MILDE.

VAR. DISSECTUM.

FINELY-DISSECTED GRAPE FERN.

This etching was drawn from a plant found in deep, rich woods in Jefferson County, Ky. It is much larger than the ferns we have seen from the Eastern States. The plate illustrates a type of laciniately-cut foliage; the fertile spike is the same as Var. obliquum, plate 62.



PLATE LXIV.

BOTRYCHIUM VIRGINIANUM. SWARTZ.

VIRGINIA GRAPE FERN.

Frond tall and ample, sterile segments, sessile above the middle of the common stalk; broadly triangular, thin and membranaceous, ternate; the short-stalked primary divisions once or twice pinnate, and then once or twice pinnatifid; the oblong lobes cut-toothed toward the apex; veins forking from a mid-vein; fertile part two to three pinnate. Rich woods; common. June.—*Gray's Manual*.

Two plants were sent to me by Prof. Wildberger; one bearing two fertile spikes, and the other bearing three.



PLATE LXV.—A.

OPHIOGLOSSUM VULGATUM. LINNÆUS.

ADDER-TONGUE.

Sterile segment ovate or elliptical-oblong, 2 to 3 inches long; rather fleshy, obtuse, narrowed at the base, and sessile near the middle of the stalk of the fertile spike. July. Not common.—*Gray's Manual*.

PLATE LXV.—B.

OPHIOGLOSSUM BULBOSUM. MICHX.

Plant about a span high, often shorter; root perennial, a globose umber-brown bulb, with two or three radicles proceeding from the under part and invested with tunicated scales at its apex; stipe simple, naked, terete, supporting a single heart-shaped, acute, entire frond, reticulately veined on its upper disk; spike about three quarters of an inch long, linear, acuminate, pedunculate; peduncle varying in length from 1 to 2 inches. Grows in low sandy grounds from New Jersey to Carolina.—*Pursh*.

Flowering time, May.—*Barton's Flora of N. A.*, vol. xi, p. 61.



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